

Appln. No. 10/534,087
Amendment dated March 2, 2009
Reply to Office Action Dated October 30, 2008

REMARKS

In paragraph number 3a of the Official Action, the Examiner questions the content of our amended Specification in paragraphs numbered [016] and [017].

By way of further explanation, aromatic mono-, or diboronic acid and mono- or diboronate compounds disclosed in Refs 4-6, such as F2BA in our application, are widely used in Suzuki reactions for the preparation of conjugate organic compounds or conjugate polymers. The boronic acid or boronate groups on these compounds are leaving groups in these reactions. This means they are eliminated in the reaction and do not remain in the final product. Furthermore the boronic acid or boronate groups themselves do not produce any cross-linked structures in the final product.

However, in our invention, we designed the structure based on another reaction of boronic acid, ie, dehydration of the boronic acid. The boronic or boronate groups in our materials are used for cross-linking. They are not eliminated from the final product. The dehydration reaction of the boronic acid under heating or vacuum forms boroxine ring structure, and acts as a grafting or cross-linking point dependent on the molecular structures. Therefore, the reaction of the compounds which contain two or more boronic acid or boronate groups will create cross-linked structures. Although the phenomenon of the dehydration reaction is well known, and mentioned in some of the references 4-6, this is the first time to report the use of this reaction for cross-linking in the context of this invention.

Accordingly, it is submitted that no amendment is required.

In paragraph 3 b., the Examiner questions the content of reaction schemes 2 and 3. It is submitted that the two reaction schemes are different, in that

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reaction scheme 2 illustrates an esterification reaction involving an oligofluorene diboronic acid (F_nBA), and reaction scheme 3 illustrates a transesterification reaction of an oligofluorene diboronic acid ester F_nBOEt . An explanation of this is included in paragraphs [082] and [083] of our Specification.

The Examiner will also note the correction made to page 18 of the Specification.

Next, in paragraph no. 4., the Examiner has objected to the numbering of our claims, and has taken the initiative and erroneously re-numbered allegedly mis-numbered claims 18-25 as 17-24. In fact, what has happened in the Preliminary Amendment is that we inadvertently excluded claim 17 from the list of claims. In fact, Claim 17 has never been cancelled.

Accordingly, we have based further claim amendments on the Examiner's new claim numbering, and have cancelled original claim 17.

In paragraphs 5 and 6 of the action, the Examiner rejects claims 1-24 under 35 U.S.C. 112, second paragraph, as being Indefinite, in view of the use of various terms in the specified claims. In this amendment, the terms in question have been deleted. The reference to the figures has also been removed from the claims. Also, the term "etc" has been removed.

Regarding the terms " $CzBA$ and F_nBA ", these terms are specifically identified in our Specification in paragraph [0086] as organoboronic acids and in Schemes 1 and 2 at pages 17 and 18, by their structures. Also, $CzBA$ is specifically described in paragraph [0117], and various oligofluorene boronic acids in Table I in paragraph [0114]. Moreover, the Examiner does not seem to have any difficulty in identifying Cz as carbazole in paragraph 10 of the

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action. Accordingly, there should be no need to remove these terms from the claims.

With respect to the Claim rejections, first, claims 1-9, 11-18 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable (ie Obvious) over the disclosure in a primary reference, Woo et al(6,309,763), combined with the disclosures of two secondary references, Snyder et al. and Anderson et al. .

Woo et al. is alleged to disclose fluorene and arylamine "co-polymers", and some fluorene monomers containing boronic acid and boronate groups. The Examiner is correct in this respect. However, it is apparent that the "copolymers" in the reference are not cross-linked. It is apparent that the boronic acid and boronate groups are used only for the preparation of polymers and are eliminated after the reaction and will not produce cross-linked structures.

On the other hand, the boronic acid or boronate groups in our materials are specifically used for cross-linking and are included in the final products.

Furthermore, the Examiner brings in the disclosure of the Snyder et al. reference to argue that it would be obvious to use the process of Snyder et al.(including the gentle heating conditions and the removal of water), intrinsically resulting in cross-linking.

It is respectfully submitted that although it is known that this type of molecule containing a boronic acid group could lose water under heating to form dehydrated boroxine structure, however, this does not necessarily mean that this reaction will result in a cross-linked structure.

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In fact, the essential condition to form the cross-linked structure is that it has to contain at least one difunctional molecule.

Accordingly, our claims have been restricted to the "structures" shown in figure 10, wherein the values of a, b and c are included.

It is submitted that this amendment together with the arguments presented above, defeat any prima facie cases of Obviousness, based upon the cited references.

Next, the Examiner has rejected all of our claims 1-24, as being Obvious, in three separate rejections, based upon the disclosures of various combinations of references, with a primary reference, Woo et al. USP 6,309,763. See paragraphs 9., 10., and 11. of the action.

It is emphasized that there is no disclosure in any of the cited references of the combination of a boronic acid or boronate with "di- or polyols or thiols", to provide cross-linked composites. Our claims have now been restricted to such composites.

Accordingly, the Examiner is requested to consider and withdraw the issue.

The other two Obviousness rejections are set forth in paragraphs 10. and 11. The additional references are also silent on the use of "di- or polyols or thiols" as reactant. Accordingly, the Examiner is also requested to re-consider and withdraw this issue.

In support of these arguments, the Examiner will note that we have canceled independent product-type claim 1, and entered a new independent product claim 25, which is fully supported by our Specification e.g in Figure 10.

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We have also cancelled independent process claim 4 and have amended claim 21 to be of the same scope as new claim 25.

We have also cancelled claims 2, 4, 5, 8, 12 and 17, without prejudice.